



## Lymphoblastoid transmembrane potential in bipolar patients, their siblings, and unrelated healthy comparison subjects

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### Abstract

Bipolar illness appears to be characterized by alterations in ionic homeostasis that are related to mood state. This is reflected by reports of altered intracellular sodium and calcium concentrations, altered sodium pump ( $\text{Na}^+$ ,  $\text{K}^+$ -adenosine triphosphatase), and calcium pump ( $\text{Ca}^{2+}$ -adenosine triphosphatase) activity. Recent ex vivo studies with fresh lymphocytes and in vitro studies with cultured lymphoblasts suggest that there may be an enduring trait-related abnormality in  $\text{Na}^+$ ,  $\text{K}^+$ -adenosine triphosphatase as well. We have previously found that the lymphocyte transmembrane potential (TMP) varies with mood state. To examine the question of trait-related changes in TMP, we studied TMP of immortalized lymphoblasts from 14 patients with bipolar illness, nine unaffected siblings, and eight normal subjects. TMP was the same in all three groups. These preliminary data suggest that TMP is a state- rather than a trait-related marker.

**Keywords:** Affective disorder; Ion channels; Sodium; Calcium; Mood state

### 1. Introduction

Abnormalities in cation distribution (Coppen and Shaw, 1963; Coppen et al., 1966; Naylor et al., 1971, 1973, 1974; Dubovsky et al., 1992a, 1992b) and ion transport systems (Choi et al., 1977; Scott and Reading, 1978; Rybakowski et al., 1981; Hokin Neaverson and Jefferson, 1989a, 1989b; Looney and El-Mallakh, 1993) have been reported

in both the manic and depressed phases of bipolar disorder. For example, whole body and intracellular sodium ( $\text{Na}^+$ ) concentrations are increased in both phases of bipolar disorder (Coppen and Shaw, 1963; Coppen et al., 1966; Naylor et al., 1971), and free intracellular calcium ( $\text{Ca}^{2+}$ ) is increased in both platelets and lymphocytes of untreated manic or depressed bipolar patients (Dubovsky et al., 1989, 1991, 1992b).

These changes in ion distribution are believed to reflect altered functions of ion channels or membrane pumps, neurotransmitter changes, or second

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